Claims

5   1. A remote polling and control system in a heterogeneous
     wireless data transmission network for communication between
     a variety of wireless nodes (PUs, SAs and/or SPs) intercon-
     nected via said network,
     characterized by
10   control means (PU) for polling (S1b) data from remotely ac-
     cessible nodes (SPs) of a first type located in said network
     and/or remotely controlling (S1c') functions executable by
     remotely controllable nodes (SAs) of a second type, said
     nodes (SAs, SPs) being in a stand-by mode before and after
15   being called by said control means (PU).

     2. A remote polling and control system according to claim 1,
     wherein said communication is organized according to the mas-
     ter-slave principle,
20   characterized by
     at least one master node (PU) comprising an RF transceiver
     (aTx and aRx) designed to
     - send (S0a) a wake-up signal to at least one remote slave
       node (SP, SA) of a first and/or second type for polling
25   (S0b) information detected by said slave node (SP, SA),
     - send (S0c) control information for triggering a function to
       be executed by at least one remotely controllable slave
       node (SA) of said second type, and
     - receive (S0d) feedback information from said slave nodes
30   (SA and/or SP).

     3. A remote polling and control system according to anyone of
     the claims 1 or 2,
     characterized in that

said network (WSN) is configured in a meshed, star or hybrid
star and meshed topology.

4. A remote polling and control system according to claim 3,
said network (WSN) having a meshed topology for a peer-to-
peer-based ad-hoc communication between wireless nodes (PU,
SA, SP),
characterized by
a CSMA-based MAC protocol for guaranteeing collision avoid-
ance when different nodes (PUs, SAs and/or SPs) are trying to
simultaneously transmit data.

5. A remote polling and control system according to claim 2,
characterized in that
the remote slave node (SP) of said first type comprises
- receiving means (pRx) for wirelessly receiving (S2a) a
   wake-up signal indicating a need for transmitting a polling
   request message from said master node (PU) to said slave
   node (SP),
- transmitting means (pTx) for wirelessly transmitting (S2b)
   sensor data or requested status information to said master
   node (PU) upon reception of said polling request message by
   backscattering an RF signal obtained by modulating an elec-
   tromagnetic field provided by said master node (PU) or any
   other node with an encoded signal representing said status
   information, and
- processing means for processing (S2c) and creating (S2c′)
   dynamic data.

6. A remote polling and control system according to claim 2,
characterized in that
the remotely controllable node (SA) of said second type com-
prises
- receiving means (pRx) for wirelessly receiving (S3a) a
   wake-up and remote control signal from the master node (PU)

or another node of said second type (SA),

- optional sensor elements (SSA) for detecting (S3b) opera-
  tional parameters of said slave node (SA) and/or environ-
  mental data and/or remotely controllable actuator elements
  (ASA) for executing (S3c) programmable actions,

- processing means for executing (S3d) a remotely controlla-
  ble application running on said node (SA) for monitoring
  (S3e) and gathering (S3e') sensor data detected by said
  sensor elements (SSA) and/or controlling (S3e'') said ac-
  tuator elements (ASA), and

- transmitting means (aTx) for wirelessly transmitting (S3f)
  information from said application to said master node (PU)
  upon reception of said wake-up and remote control signal.

7. A remote polling and control system according to claim 2,
5 or 6,
characterized by
said remotely controllable slave node (SA) of said second
type additionally comprises
transmitting means (pTx) for wirelessly transmitting (S3g)
data or requested status information upon reception of a
polling request message from a further node (SA') by back-
scattering an RF signal obtained by modulating an electromag-
netic field provided by said master node (PU) or any other
node with an encoded signal representing said status informa-
tion to said further node (SA') when being operated in a mo-
bile ad-hoc network having a meshed topology and communicat-
ing with said further node (SA') on a peer-to-peer basis.

8. A remote polling and control system according to anyone of
the claims 2 or 5 to 7,
characterized in that
said master node (PU) is connected to a bridge (B) providing
a wireless or wired communication link to at least one other
master module (PU').

9. A method for enabling at least one master node (PU) of a remote polling and control system (430, 450, 460 or 470) in a heterogeneous wireless network according to anyone of the claims 2 to 8 to remotely control at least one slave node (SA, SP),

characterized in that

said master node (PU) performs the steps of

- transmitting (S1a) a wake-up and control signal for polling (S1b) sensor data detected and/or data created and/or processed by a remotely accessible slave node (SP) of a first type located in the range of said master node (PU) or any other node providing an electromagnetic field to be modulated by said slave node (SP) and/or

- remotely activating (S1c), controlling (S1c') and/or deactivating (S1c'') functions executable by a slave node (SA) of a second type, said slave nodes (SA, SP) being in a stand-by mode before and after being called by the master node (PU).

10. A method according to claim 9,

characterized in that

the slave node (SP) of said first type performs the steps of

- wirelessly receiving (S2a) a wake-up signal indicating a need for transmitting a polling request message from said master node (PU) to said slave node (SP),

- wirelessly transmitting (S2b) data or requested status information to said master node (PU) upon reception of said polling request message by backscattering an RF signal obtained by modulating an electromagnetic field provided by said master node (PU) or any other node with an encoded signal representing said status information, and

- executing (S2c) commands upon reception of a wake-up and control message.

11. A method according to anyone of the claims 9 or 10, characterized in that

the slave node (SA) of said second type performs the steps of

5   – wirelessly receiving (S3a) digitally encoded polling and/or control information from said master node (109),

     – after having detected (S3a') a valid identification code of said master node (PU) in the header of the received polling and/or control information, executing (S3d) a remotely con-

10   trollable application running on said slave node (SA) for monitoring (S3e) and gathering (S3e') ·operational parameters of said slave node (SA) and/or environmental data detected by sensor elements (SSA) connected to said slave node (SA), in the following referred to as „status informa-

15   tion", and/or controlling (S3e'') actuator elements (ASA) controllable by said slave node (SA), and

     – wirelessly transmitting (S3f) a digitally encoded version of said status information as a feedback signal to said master node (PU).

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12. A method according to anyone of the claims 9 or 10, characterized in that

the slave node (SA) of said second type performs the steps:

     – while not being in vicinity of a master node (PU), wire-

25   lessly transmitting (S3f) feedback information from an application running on said slave node (SA) to a further node (SA') upon reception of a wake-up and/or remote control signal from said further node (SA') and,

     – while being in vicinity of a master node (PU), wirelessly

30   transmitting (S3g) data or requested status information upon reception of a polling request message from the master node (PU) by backscattering an RF signal obtained by modulating an electromagnetic field provided by said master node (PU) or any other node in said network with an encoded

signal representing said status information to said master node (PU).

13. Use of a remote polling and control system according to anyone of the claims 1 to 8 for controlling applications running on nodes of a wireless sensor network (WSN).